

PATENT COOPERATION TREATY

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 15 May 2000 (15.05.00)	
International application No. PCT/GB99/02943	Applicant's or agent's file reference SAH01191WO
International filing date (day/month/year) 06 September 1999 (06.09.99)	Priority date (day/month/year) 07 September 1998 (07.09.98)
Applicant ARDAVAN, Arzhang et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

24 March 2000 (24.03.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Pascal Piriou Telephone No.: (41-22) 338.83.38
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WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



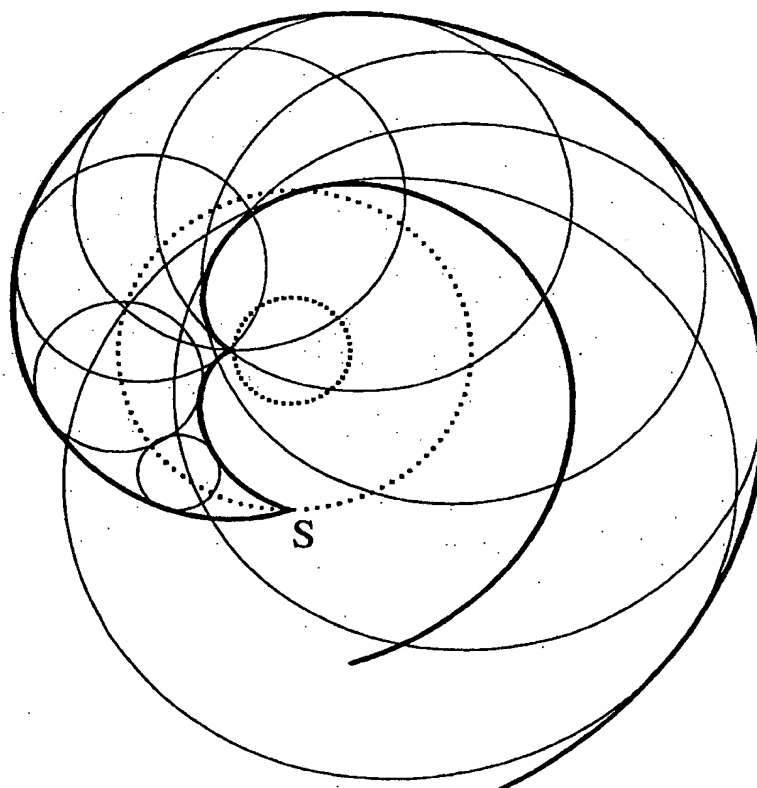
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : G21K 1/16, 1/00		A1	(11) International Publication Number: WO 00/14750
			(43) International Publication Date: 16 March 2000 (16.03.00)
(21) International Application Number: PCT/GB99/02943		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 6 September 1999 (06.09.99)			
(30) Priority Data: 9819504.3 7 September 1998 (07.09.98) GB			
(71)(72) Applicants and Inventors: ARDAVAN, Arzhang [GB/GB]; Wolfson College, Linton Road, Oxford OX2 6UD (GB). ARDAVAN, Houshang [GB/GB]; New Hall, Huntingdon Road, Cambridge CB3 0DF (GB).			
(74) Agent: GILL JENNINGS & EVERY; Broadgate House, 7 Eldon Street, London EC2M 7LH (GB).		Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	

(54) Title: APPARATUS FOR GENERATING FOCUSED ELECTROMAGNETIC RADIATION

(57) Abstract

An apparatus for generating electromagnetic radiation comprises a polarizable or magnetizable medium. There is means of generating, in a controlled manner, a polarization or magnetisation current whose distribution pattern has an accelerated motion with a superluminal speed, so that the apparatus generated both a non-spherically decaying component and an intense spherically decaying component of electromagnetic radiation.



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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SAH01191W0	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 99/ 02943	International filing date (day/month/year) 06/09/1999	(Earliest) Priority Date (day/month/year) 07/09/1998
Applicant ARDAVAN, Arzhang et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.
☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

- ☐ as suggested by the applicant.
- ☒ because the applicant failed to suggest a figure.
- ☐ because this figure better characterizes the invention.
- 1 _____
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 99/02943

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G21K1/16 G21K1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G21K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	BOLOTOVSKII B M ET AL: "Radiation by charges moving faster than light" USPEKHI FIZICHESKII NAUK, JUNE 1990, USSR, vol. 160, no. 6, pages 141-161, XP000867619 ISSN: 0042-1294 cited in the application page 477, paragraph 1 -page 479, paragraph 3; figure 1 page 484, right-hand column, last paragraph -page 487, last paragraph	1,3,5,6
A	US 5 006 758 A (GELLERT BERND ET AL) 9 April 1991 (1991-04-09) column 1, line 64 -column 2, line 11 -/-	2,3,6

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

14 February 2000

Date of mailing of the international search report

22/02/2000

Name and mailing address of the ISA

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Authorized officer

Capostagno, E

INTERNATIONAL SEARCH REPORT

Internatic Application No

PCT/GB 99/02943

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>HEWISH A: "Problems with the superluminal pulsar model"</p> <p>MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY, 1 JUNE 1996, BLACKWELL SCIENCE FOR R. ASTRON. SOC, UK, vol. 280, no. 3, pages L27-L30, XP000874701</p> <p>ISSN: 0035-8711</p> <p>the whole document</p>	1,14
P,A	<p>ARDAVAN H: "Generation of focused, nonspherically decaying pulses of electromagnetic radiation"</p> <p>PHYSICAL REVIEW E (STATISTICAL PHYSICS, PLASMAS, FLUIDS, AND RELATED INTERDISCIPLINARY TOPICS), NOV. 1998, APS THROUGH AIP, USA, vol. 58, no. 5, pages 6659-6684, XP000874625</p> <p>ISSN: 1063-651X</p>	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB 99/02943

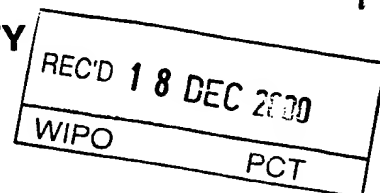
Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5006758 A	09-04-1991	CH 676168 A	14-12-1990
		EP 0363832 A	18-04-1990
		JP 2158049 A	18-06-1990
		JP 2812736 B	22-10-1998

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference SAH01191WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB99/02943	International filing date (day/month/year) 06/09/1999	Priority date (day/month/year) 07/09/1998
International Patent Classification (IPC) or national classification and IPC G21K1/16		
Applicant ARDAVAN, Arzhang et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 8 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 24/03/2000	Date of completion of this report 14.12.2000
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Meyer, J Telephone No. +49 89 2399 2728



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/02943

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:

Description, pages:

1-39 as originally filed

Claims, No.:

1-20 as originally filed

Drawings, sheets:

1/9-9/9 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/02943

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:
see separate sheet

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-20
	No:	Claims	
Inventive step (IS)	Yes:	Claims	7-10,12,15-20
	No:	Claims	1-6,11,13,14
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/02943

Re Item I

Basis of the report

- 4.1 According to Article 5 PCT, the description must disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (not by an inventor, and of course, within the whole wording of the independent claim, not only for an intensity diminishing with the distance R from the source like R^{-1} (cf. D4), and not only for a charge moving in a medium but also for a charge moving in empty space (cf. D1, page 477, left-hand column), and not only for a single apparatus, but for all claimed devices (cf. also the present description, page 3, fifth section: rotates about a fixed axis with a constant angular frequency). At present, there are serious doubts about the sufficiency of the disclosure (cf. D3 (in particular Chapter 4; page L29, left-hand column, third paragraph), D5 to D8; the references cited in these documents D3, D5 to D8; in particular D8, page 2, second section: Dr. Ardavan is confident that, if the machine can be coaxed into doing this, it will radiate in exactly the way he predicts; page 2, last section: ultimate arbiters).
- 4.2 Until now, the applicant has not proved that the invention at all has been carried out. The applicant bears the burden of proof of the facts in his favour.
- 4.3 Generally, there is a distinction to be made between inventions which will not work at all, such as ones that violate known physical laws, and inventions which the skilled person cannot carry out on the basis of the information disclosed in the application. In both cases, the requirements of Article 5 PCT are not satisfied. In addition, in the first case, there is no industrial applicability of the invention; at present, it cannot be proved that the present teaching violates known physical laws; otherwise, the industrial applicability (cf. ITEM V. of this report) must be judged correspondingly.

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/02943

1. Reference is made to the following documents:

- D1: BOLOTOVSKII B M ET AL: 'Radiation by charges moving faster than light' USPEKHI FIZICHESKII NAUK, JUNE 1990, USSR, vol. 160, no. 6, pages 141-161, XP000867619 ISSN: 0042-1294 cited in the application; pages 477 - 487 of the English language translation)
- D2: US-A-5 006 758 (GELLERT BERND ET AL) 9 April 1991 (1991-04-09)
- D3: HEWISH A: 'Problems with the superluminal pulsar model' MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY, 1 JUNE 1996, BLACKWELL SCIENCE FOR R. ASTRON. SOC, UK, vol. 280, no. 3, pages L27-L30, XP000874701 ISSN: 0035-8711
- D4: ARDAVAN H: 'Generation of focused, nonspherically decaying pulses of electromagnetic radiation' PHYSICAL REVIEW E (STATISTICAL PHYSICS, PLASMAS, FLUIDS, AND RELATED INTERDISCIPLINARY TOPICS), NOV. 1998, APS THROUGH AIP, USA, vol. 58, no. 5, pages 6659-6684, XP000874625 ISSN: 1063-651X
- D5: John Hannay: "Faster than the speed of light", pages 1 - 2, received from the Internet under www.phy.bris.ac.uk/research/theory/hannay1.pdf
- D6: J. H. Hannay: "Comment on 'Method of handling the divergences in the radiation theory of sources that move faster than their waves'", pages 1 - 3, received from the Internet under www.phy.bris.ac.uk/research/theory/hannay2.pdf
- D7: J. Li: "Singularities in a Relativistic Pulsar Wind", Publ. Astron. Soc. Aust., 1998, vol. 15, pages 328 - 331
- D8: "Lawbreakers?", received from the Internet under www.economist.co.uk/0Oo5ZBau/editorial/freeforall/20000819/st9136.html

The documents D5 to D8 were not cited in the international search report.

2. D4 has been published after the present priority date.
3. The following statements are made with the reservation that the present teaching does not violate known physical laws and that therefore the invention is susceptible of industrial application (cf. also ITEM I. above).

4. Novelty (Article 33 (2) PCT)

None of the available documents discloses the subject-matter of present Claims 1 to 20. Therefore, it must be assumed that the subject-matter of present Claims 1 to 20 is novel.

5. Inventive Step (Article 33 (3) PCT)

5.1 Already in D1 (cf. the whole English language translation, in particular pages 477 - 479, above all page 479, Figures 1, 2: dielectric bars (cf. page 478, left-hand column, second section); Chapters 4 and 5 concerning rectilinear and circular superluminal motion of a charge; page 487, right-hand column, third section: experiments with practical electronics) an apparatus including a special mechanism is suggested to realize lumped effective charges and currents of the superluminal sort. It must be assumed that, if the skilled person is able to achieve an apparatus of present Claim 1, this person was already able to achieve such an apparatus from the teaching of D1. Therefore, if the skilled person is able to practise the present teaching (cf. Item I. above), it must be assumed that this skilled person already achieves, when starting from D1, the subject-matter of present Claim 1 (realized effective currents; cf. page 479, left-hand column, third section), 2 (dielectric bars), 3 (cf. page 479, left-hand column, third section: mechanism to move the charges; cf. also D3, page L27, right-hand column, last section, suggesting exciting an array of radiators), 4, 5 (cf. chapter 5.; cf. also D3, page L29, right-hand column, last section to page L30, first section), 6 (cf. Figures 1, 2), 11 (cf. the title; obvious application of such radiation), 13, 14 (Article 33 (3) PCT).

5.2 It must be assumed that the subject-matter of present Claims 7 to 10, 12, 15 to 20 is not obvious from the available prior art. Therefore, it must be assumed that the subject-matter of these claims involves an inventive step.

Re Item VII

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/02943

Certain defects in the international application

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D3 is not mentioned in the description, nor is this document identified therein.

Re Item VIII

Certain observations on the international application

The present version of claims does not meet the requirements of Article 6 PCT.

1. In Claim 1, the expression "polarizable of (or?) magnetizable medium" is not clear; also the term "generated" (generates?) is not clear; the term "intense" is a relative term, which, in general, cannot form a clear distinguishing feature, which however may not be removed in order to avoid added subject-matter; it is not clearly defined where the polarization or magnetisation current is generated (in the polarizable or magnetizable medium?). Moreover, any independent claim must contain all features essential for achieving the desired effect. According to D4, page 6671, left-hand column, second section, the additional feature of present Claim 7 defining a cusp forms an essential feature (cf. also present Figure 6 and the related text; page 26, second section; present Figures 8, 9 and the related text; page 29, last but one section).
2. Furthermore, it appears that, in Claim 1, the distribution pattern having an accelerated motion with a superluminal speed, so that the apparatus generates both a non-spherically decaying component and an intense spherically decaying component of electromagnetic radiation, defines a result to be achieved (cf. also Item I. above); functional features defining a technical result are permissible in a claim only if, from an objective viewpoint, such features cannot otherwise be defined more precisely without restricting the scope of the invention, and if these features provide instructions which are sufficiently clear for the expert to reduce them to practice without undue burden, if necessary with reasonable experiments.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/02943

3. In Claim 3, the expression "means for (of?) generating" does not have a clear antecedent in Claim 1; also in Claim 3, it is not clearly defined where the polarization current is induced. Also in Claim 3, the sufficient rate defines a result to be achieved (cf. point VIII.2. above). Moreover, in Claim 3, the term "opposite" is not clear (opposite with respect to what? cf. present Figure 7).
4. In Claim 5, the term "medium" is missing.
5. In Claim 8, the terms "compact", "intense", "high frequencies" cannot define clear distinguishing features.
6. In Claim 12, a result to be achieved is defined ("...such that ..."; cf. point VIII.2. above).
7. In Claim 13, the term "expand" does not form a clear distinguishing feature (with respect to what?); also the additional feature of Claim 13 defines a result to be achieved; the expressions "effective bandwidth" and "free space" are not clearly defined.
8. In Claim 14, the relative expression "highly compact" is not clear; also Claim 14 defines a result to be achieved.
9. In Claim 15, the body has no clear antecedent (body to be diagnosed?).
10. The description is not consistent with the claims, thereby rendering the claims unclear. There are only product claims and no method claims, contrary to the description (cf. e. g. page 1, first and second paragraphs).